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ChatGPT for research and publication: Opportunities and challenges

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Abstract

This position paper explores the potential opportunities and challenges in the adoption of OpenAI's ChatGPT for scholarly research and publication. ChatGPT was launched in November 2022 for public use, and it has already garnered enormous attention for a variety of applications in academia. Researchers are adopting ChatGPT at different stages of research including idea generation, summarizing literature, and manuscript preparation. Notably, several research articles have even attributed authorship to ChatGPT, sparking a new debate on the role of AI in authorship. We contend that ChatGPT has far-reaching implications for scholarly research and publication going forward. In this paper, we investigate its current use in contemporary research and based on this we outline the opportunities that ChatGPT could potentially offer. We believe that ChatGPT could be leveraged by researchers, journal editors, and reviewers to make the research and publication process more efficient. Later, we discuss the challenges and concerns exposed by ChatGPT that require immediate attention such as AI authorship, unintentional plagiarism, nonexistent references, and threats of international inequalities. We conclude with optimistic expectations for ChatGPT adoption in research in the future.

Keywords: Artificial intelligence; ChatGPT; education; large language models; OpenAI; research.

Introduction

ChatGPT is a state-of-the-art artificial intelligence (AI) chatbot developed by an American AI research laboratory, OpenAI. ChatGPT belongs to the generative pre-trained transformer (GPT) family of large language models (LLMs). Its fine-tuning process leverages both supervised learning and reinforcement learning (OpenAI, 2022). This language model is capable of generating coherent and contextually relevant responses to a wide range of conversational prompts. Since its launch in November 2022, ChatGPT has seen an exponential increase in the total number of users who are using the platform for diverse purposes. These include writing programs, writing academic essays, performing translation, composing music (Gonsalves, 2023), and answering questions, among others. Besides, it is also gaining popularity among scholarly communities. Researchers have already been using ChatGPT to write essays and talks, summarize an article, write a literature review, draft and improve papers, as well as identify research gaps and write computer code, including statistical analyses (van Dis et al., 2023).

Several researchers have recently studied ChatGPT's potential for academic use. In a position paper by Kasneci et al. (2023), the authors explored the potential benefits of ChatGPT for enhancing the learning experience of students and supporting the work of teachers. While optimistic about its potential, they cautioned about privacy, security, regulatory, and ethical concerns. In another study, Rudolph et al. (2023) studied ChatGPT's implications in higher education. They suggested crucial recommendations for higher education teachers and institutions to facilitate learning, teaching, and assessment using ChatGPT. In a separate study, Sullivan et al. (2023) also explored ChatGPT's implications for higher education, discussing opportunities to enhance student learning and access.

Zhai (2022) utilized ChatGPT to compose an academic paper on "Artificial Intelligence for Education." His findings suggest that the writing was "coherent, (partially) accurate, informative, and systematic." Similarly, Chen (2023) investigated ChatGPT's ability in scientific writing and demonstrated its potential benefits in translation by presenting a Chinese-to-English translation of his writing. Aydın and Karaarslan (2022) experimented with generating a ChatGPT-based literature review on digital twins for healthcare. They discovered that while it is possible, it can lead to significant plagiarism or inadequate paraphrasing. However, Gao et al. (2022) claimed that it is possible to produce original abstracts without explicitly plagiarizing them, which may still be identified as having been generated by an AI platform using an AI output detector.

In a recent article by Chris Stokel-Walker (2023), it was reported that ChatGPT has been credited as a co-author in at least four research articles. For instance, in an editorial by

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Siobhan O'Connor published in *Nurse Education in Practice* (O'Connor & ChatGPT, 2023), ChatGPT was listed as an author. Nevertheless, authorship attribution of AI-generated work is a highly contested topic in the publishing community. Some prominent publishers, including Science, Nature, and JAMA Network, have explicitly stated that AI tools cannot be acknowledged as authors in their publications (Brainard, 2023).

This paper aims to explore the potential opportunities that the use of ChatGPT can bring to academic research and publication. Furthermore, we discuss the challenges associated with the adoption of ChatGPT in this context. It is our belief that the benefits of ChatGPT can only be fully realized if the challenges identified are effectively addressed. Given the mounting workload and intensifying competition in academia, it is highly probable that ChatGPT's adoption will become increasingly widespread among the research community.

Opportunities in research and publication

In this section, we aim to investigate the potential opportunities for ChatGPT utilization throughout the research life cycle, spanning from ideation to publication in a peer-reviewed journal. In this process, we must take into account the involvement of three key human actors: the researcher, the reviewer, and the journal editor.

Opportunities for researchers

It is reasonable to assert that ChatGPT is most advantageous for researchers specializing in natural language processing and machine learning. Scholars working on topics such as text categorization, sentiment analysis, machine translation, and speech recognition can reap the full benefits of ChatGPT through proper piloting. Nevertheless, researchers from diverse fields such as social science, life sciences, medicine, business, and engineering can also employ ChatGPT strategically. For instance, ChatGPT can assist in creating questionnaires or surveys for research purposes. To evaluate the influence of social media on consumer behavior, we tasked ChatGPT with developing a survey questionnaire. We discovered that ChatGPT could generate meaningful multiple-choice, open-ended, dichotomous, and rating scale questions. This is just one illustration of ChatGPT's potential for use in different stages of a research study.

The standard research study process can be segmented into five key stages (Cargill and O'Connor, 2021): idea generation, prior literature synthesis, data identification and preparation, testing framework determination and implementation, and results analysis. ChatGPT can effectively assist researchers in the first four stages of research, as it cannot analyze empirical output currently. Dowling & Lucey (2023) demonstrated the effectiveness of ChatGPT for finance research in cryptocurrency through structured testing, highlighting its advantages in idea generation and data identification, but poor performance in literature synthesis and developing appropriate testing frameworks. They also showed that the addition of private data and domain expertise inputs can significantly improve ChatGPT's output quality in research. As ChatGPT continues to evolve, it has the potential to become an e-Research Assistant and be utilized in all stages of research, including results analysis.

Once the research is completed, ChatGPT can prove valuable in manuscript preparation. By properly prompting ChatGPT, researchers can obtain an acceptable initial manuscript draft, which can then be further refined through collaboration with the AI tool (Zhai, 2022). This can be especially beneficial for researchers whose native language is not English, who could also use ChatGPT for translating their manuscripts into English, going beyond just grammar and spelling checks. As such, ChatGPT has the potential to eliminate language barriers and assist researchers form non-English speaking researchers in crafting high-quality texts (Liebrenz et al., 2023). In certain aspects, ChatGPT has proven to be more beneficial when compared to a paid English-editing service (Kim, 2023).

Once the manuscript is prepared, researchers often struggle to determine the most suitable journal for submission, as they must carefully review the 'aims and scope' of various journals to be able to choose the right publishing platform for their work. This can be a tedious and time-consuming process. However, ChatGPT can serve as an efficient journal-suggestion tool for various publishing groups, providing accurate recommendations and saving significant time for researchers. Remarkably, ChatGPT can even suggest relevant journals based solely on the manuscript's title. Nevertheless, it performs better when the manuscript's abstract is also utilized. By using various conversational prompts, researchers can refine their queries to receive more accurate suggestions. In our study, we tested ChatGPT's ability to suggest journals from various publishers, such as Springer, Elsevier, Taylor & Francis, Emerald, Wiley, and Sage, and verified the validity of the suggestions using recently published articles, includeing our own. The results were satisfactory, as demonstrated in Appendix A1 and A2.

An additional opportunity for researchers is to utilize ChatGPT as a tool for suggesting potential reviewers. Oftentimes, authors are required to suggest 3-5 potential reviewers for their manuscript. By providing ChatGPT with the manuscript abstract, it can recommend expert reviewers suitable for peer review. Editors can also benefit from this convenience, as discussed in the next section. We used prompts such as "Suggest 3 expert reviewers for the manuscript with the following abstract: XYZ." Our findings indicate that ChatGPT can suggest relevant experts with appropriate affiliations who are real people. However, we encountered some discrepancies in affiliations, as ChatGPT's training data cutoff is the year 2021. Query prompts can be further specified based on special interests, such as "Suggest 3 American reviewers" and "Suggest 2 American and 1 Canadian reviewer". An example of ChatGPT piloting for reviewer suggestions is presented in appendix A3.

Opportunities for editors

Editors play a pivotal role in the publication of research. Upon manuscript submission, the corresponding editor

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conducts technical, ethical, and eligibility assessments before deciding to reject the manuscript or initiate the peer review process. Technical assessments evaluate the manuscript's quality and its potential to make an original scholarly contribution worthy of publication in the target journal. Eligibility assessments ensure that the manuscript aligns with the journal's scope and adheres to its guidelines and style. Ethical assessments typically involve checking plagiarism, copyright, data privacy, and conflict of interest, among other issues. In all three areas, ChatGPT can serve as a valuable virtual assistant to the editor. For instance, ChatGPT can perform manuscript quality checks, journal fit checks, and plagiarism checks to support the editor in decision-making. Nonetheless, the editor must make the final decision, not the chatbot, as they may be subject to certain biases and inaccuracies.

Furthermore, as mentioned in the previous section, editors can also utilize ChatGPT to identify appropriate reviewers who can provide an objective evaluation of the manuscript. The process would be similar to that of authors as discussed earlier. Moreover, editors can take advantage of ChatGPT to draft tailored acceptance or rejection letters for the authors.

Opportunities for reviewers

Reviewers are experts in their respective fields who are tasked with evaluating the quality and significance of the research being presented. Due to the mounting workload in academia, reviewers often have limited time available. In such situations, ChatGPT can prove to be an indispensable tool for reviewers. ChatGPT can assist them with various tasks such as evaluating the novelty and quality of the research, assessing the clarity, coherence, and conciseness of the writing, and providing detailed comments and critiques on the manuscript's strengths and weaknesses, as well as offering suggestions for improvement. ChatGPT can also help reviewers to check whether the authors have addressed their comments appropriately in the revised manuscript. It is important to note, however, that human reviewers must make the final decision as they possess the necessary domain-specific knowledge and expertise to assess the research thoroughly.

Challenges in research and publication

As ChatGPT becomes increasingly prevalent in the research community, it poses several challenges that need to be addressed to fully realize its potential. Some significant concerns are outlined below.

i. *AI authorship*: As previously mentioned, there is an ongoing debate on whether ChatGPT can be considered a co-author in research. This is because AI cannot be held accountable for the research output, making it ineligible for authorship. To address this issue, publishing companies must establish and adhere to strict AI authorship guidelines (van Dis et al., 2023; Liebrenz et al., 2023).

ii. *Nonexistent references*: When prompted to generate citations, ChatGPT sometimes produces hallucinations by providing references that are incorrect or non-existent. For instance, when asked to discuss the relationship between cutting speed and surface roughness in machining and provide appropriate citations, ChatGPT generated three seemingly credible references that do not actually exist.

- Prabhu, S., & Ramamoorthy, B. (2019). Influence of cutting parameters on surface roughness and tool wear during turning of AISI 304 stainless steel. *Journal of Materials Research and Technology, 8*(5), 4929-4939. Doi: 10.1016/j.jmrt.2019.07.002

- Balasubramanian, V., Palanikumar, K., & Karthikeyan, R. (2017). An experimental investigation of surface roughness in milling of AISI 304 stainless steel. *Measurement, 100*, 116-125. Doi: 10.1016/j.measurement.2016.12.012

- Zhang, L., Wang, X., & Qian, X. (2019). Effect of cutting parameters on surface roughness and residual stress in high-speed milling of Ti-6Al-4V. *Materials, 12*(2), 302. Doi: 10.3390/ma12020302

Ensuring the validity of references and citations is a crucial responsibility for researchers, as inaccuracies can have serious consequences for the quality and integrity of the research. Therefore, researchers should exercise due diligence by cross-checking all citations and references generated by ChatGPT, as AI is not accountable for the accuracy of its suggestions. Ultimately, it is the responsibility of the researchers to ensure the validity of all aspects of their research, including references and citations.

iii. *Unintentional plagiarism*: Proper citation and attribution are crucial for avoiding plagiarism and giving credit where it is due. ChatGPT's tendency to reproduce text without appropriate citations or attribution can pose a significant challenge for researchers using the tool. It is essential for the developers and researchers to address this issue to ensure that ChatGPT produces accurate and ethical outputs that meet scholarly standards. This could involve incorporating mechanisms for identifying and citing sources, or training the model to recognize and properly attribute previous work. Ultimately, it is the responsibility of the researchers using ChatGPT to ensure that they properly cite all sources and avoid any unintentional plagiarism.

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iv. *Biases and inaccuracies:* OpenAI have stated, "ChatGPT sometimes produces responses that sound plausible but are incorrect or nonsensical." Additionally, conversational AI can amplify and replicate both human and algorithmic biases, making it challenging to distinguish between factual and misleading information. This poses a significant risk to researchers, editors, and reviewers who may inadvertently accept biased and inaccurate information. To mitigate this risk, it is crucial to maintain awareness and vigilance while using ChatGPT and other AI technologies in research and publishing.

v. *Need for state-of-the-art model training*: As with any machine learning model, ChatGPT's performance is heavily influenced by the quality and scope of the data it was trained on. ChatGP's language model was trained on a particular dataset that only includes data up to 2021, which may limit its ability to provide the latest and most accurate information when queried. This has important implications for researchers who rely on ChatGPT to assist them in their work. To ensure its effectiveness and accuracy, ChatGPT should be trained on updated datasets that reflect recent advances in global research. Recently, Bing Chat, which is ChatGPT integrated Microsoft's search engine Bing, is trying to address this issue through continual updates, thus hallucinating less.

vi. *Rise of junk science*: The widespread use of ChatGPT in research and publishing may lead to the proliferation of junk science or pseudoscience in scholarly literature. The potential emergence of predatory journals that publish fraudulent research articles generated by ChatGPT without proper peer review is a major concern. To mitigate these issues, the research community needs to be proactive in developing AI tools that can detect ChatGPT-generated texts and address the problem of unethical publishing practices.

vii. *Copyright issues*: The issue of ownership arises when it comes to texts generated by AI, such as ChatGPT. It remains unclear who holds the copyright for the texts produced by this open-source platform. Is it the individual who provided the original text that ChatGPT was trained with, or is it OpenAI, or perhaps the scientists who used the system to guide their writing? The academic community must establish clear guidelines to address these concerns.

viii. *Ethical issues*: As with any research involving AI, there are ethical issues to consider when navigating ChatGPT for research. These concerns pertain to various aspects such as data privacy and confidentiality, fairness, transparency, and potential misuse. Researchers need to prioritize ethical and responsible usage of ChatGPT. It is essential to recognize the use of ChatGPT in research explicitly and acknowledge it appropriately in the manuscript.

ix. *A threat of international inequalities*: The availability of the ChatGPT platform for researchers globally has enabled them to create scholarly works with ease. Nevertheless, it is noteworthy that OpenAI has started commercializing the platform. Going forward, scholars from underprivileged and low- to middle-income countries may not have equal access to the platform, exacerbating the current disparities in scholarly publishing worldwide.

Conclusion

The authors believe that ChatGPT can make a significant and positive contribution to the scholarly community if used ethically and sensibly. This AI tool has the potential to assist researchers at every stage of research, from ideation to results analysis, manuscript preparation, and even journal selection and reviewer suggestions. Furthermore, journal editors and reviewers could leverage ChatGPT to streamline and manage the publication process more efficiently. However, it is crucial not to become overly reliant on the technology, and the final decision must remain with the human researchers. ChatGPT should not be responsible for making decisions about manuscript acceptance or rejection for publication.

The use of ChatGPT and other LLMs has the potential to alleviate researchers' workload by facilitating research planning, conducting, and presentation. This could give researchers more time to concentrate on developing novel experimental designs, leading to potential breakthroughs across various disciplines (Liebrenz et al., 2023). Editors and reviewers could also benefit from the aid of ChatGPT, enabling them to efficiently manage the publication process and improve their overall productivity. As reviewers are also researchers, the assistance of ChatGPT can provide them with more free time to explore new research hypotheses.

Although ChatGPT presents certain challenges and apprehensions, including AI authorship, unintentional plagiarism, biases, and copyright concerns, we remain hopeful that these issues can be addressed as more scholars integrate it into their research and as the ChatGPT model advances through rigorous training. Nonetheless, to fully realize its potential, it is necessary for the research and AI communities, along with OpenAI, to ensure equal access to this transformative technology. We believe that human researchers equipped with domain-specific expertise cannot be wholly replaced by AI and that we should embrace and

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implement the benefits of AI in research. Together, human researchers and AI can collaborate to produce innovative scholarly contributions in the future.

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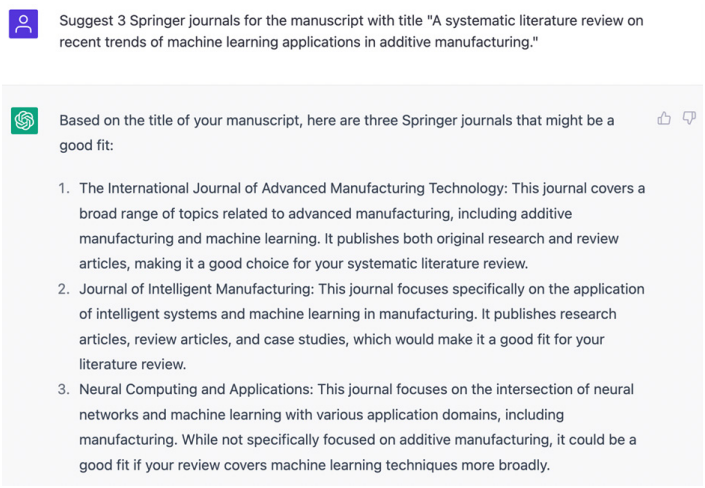
Appendix

A1. Piloting ChatGPT for journal recommendation using manuscript title.

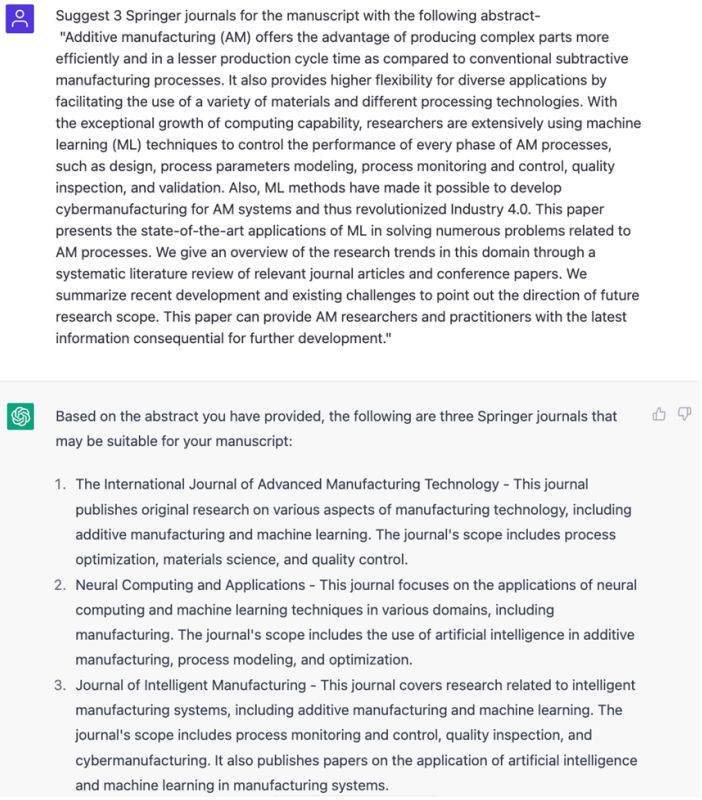
We asked ChatGPT to suggest three journals from Springer publishing that would be a good fit for the manuscript titled "A systematic literature review on recent trends of machine learning applications in additive manufacturing." ChatGPT suggested three Springer journals with proper justification for the fit (shown below).


Suggest 3 Springer journals for the manuscript with title "A systematic literature review on recent trends of machine learning applications in additive manufacturing."
Based on the title of your manuscript, here are three Springer journals that might be a good fit:
1. The International Journal of Advanced Manufacturing Technology: This journal covers a broad range of topics related to advanced manufacturing, including additive manufacturing and machine learning. It publishes both original research and review articles, making it a good choice for your systematic literature review.
2. Journal of Intelligent Manufacturing: This journal focuses specifically on the application of intelligent systems and machine learning in manufacturing. It publishes research articles, review articles, and case studies, which would make it a good fit for your literature review.
3. Neural Computing and Applications: This journal focuses on the intersection of neural networks and machine learning with various application domains, including manufacturing. While not specifically focused on additive manufacturing, it could be a good fit if your review covers machine learning techniques more broadly.

A2. Piloting ChatGPT for journal recommendation using manuscript abstract.

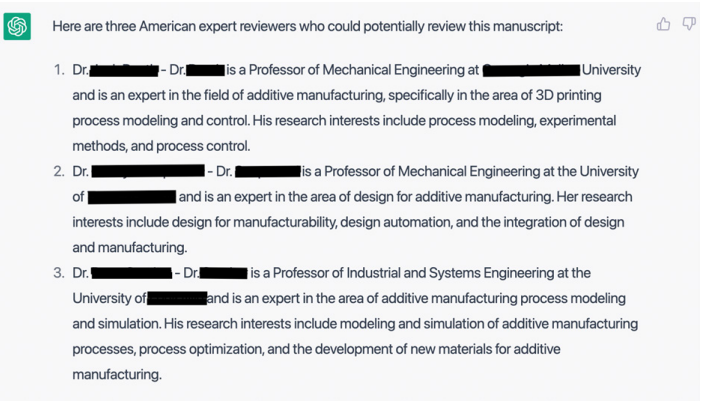
We later asked ChatGPT to suggest three journals from Springer that would be a good fit for the manuscript with a full abstract. The response is shown below. ChatGPT could successfully suggest three relevant journals.

ChatGPT provided three identical suggestions as before as the best fit for the manuscript. Note that, the title and the abstract belong to the same article. This article (Xames et al., 2022) got published in the Journal of Intelligent Manufacturing in May 2022.


Suggest 3 Springer journals for the manuscript with the following abstract-
"Additive manufacturing (AM) offers the advantage of producing complex parts more efficiently and in a lesser production cycle time as compared to conventional subtractive manufacturing processes. It also provides higher flexibility for diverse applications by facilitating the use of a variety of materials and different processing technologies. With the exceptional growth of computing capability, researchers are extensively using machine learning (ML) techniques to control the performance of every phase of AM processes, such as design, process parameters modeling, process monitoring and control, quality inspection, and validation. Also, ML methods have made it possible to develop cybermanufacturing for AM systems and thus revolutionized Industry 4.0. This paper presents the state-of-the-art applications of ML in solving numerous problems related to AM processes. We give an overview of the research trends in this domain through a systematic literature review of relevant journal articles and conference papers. We summarize recent development and existing challenges to point out the direction of future research scope. This paper can provide AM researchers and practitioners with the latest information consequential for further development."
Based on the abstract you have provided, the following are three Springer journals that may be suitable for your manuscript:
1. The International Journal of Advanced Manufacturing Technology - This journal publishes original research on various aspects of manufacturing technology, including additive manufacturing and machine learning. The journal's scope includes process optimization, materials science, and quality control.
2. Neural Computing and Applications - This journal focuses on the applications of neural computing and machine learning techniques in various domains, including manufacturing. The journal's scope includes the use of artificial intelligence in additive manufacturing, process modeling, and optimization.
3. Journal of Intelligent Manufacturing - This journal covers research related to intelligent manufacturing systems, including additive manufacturing and machine learning. The journal's scope includes process monitoring and control, quality inspection, and cybermanufacturing. It also publishes papers on the application of artificial intelligence and machine learning in manufacturing systems.

A3. Piloting ChatGPT for reviewer recommendation.

We asked ChatGPT to suggest three American expert reviewers for the manuscript with the same abstract. The response is shown below. As we can see, it is capable of suggesting relevant experts with their affiliations. We have checked for the accuracy of the information. The information provided were found all accurate. We have concealed the identities of the reviewers for the sake of data privacy.


Here are three American expert reviewers who could potentially review this manuscript:
1. Dr. [redacted] - Dr. [redacted] is a Professor of Mechanical Engineering at [redacted] University and is an expert in the field of additive manufacturing, specifically in the area of 3D printing process modeling and control. His research interests include process modeling, experimental methods, and process control.
2. Dr. [redacted] - Dr. [redacted] is a Professor of Mechanical Engineering at the University of [redacted] and is an expert in the area of design for additive manufacturing. Her research interests include design for manufacturability, design automation, and the integration of design and manufacturing.
3. Dr. [redacted] - Dr. [redacted] is a Professor of Industrial and Systems Engineering at the University of [redacted] and is an expert in the area of additive manufacturing process modeling and simulation. His research interests include modeling and simulation of additive manufacturing processes, process optimization, and the development of new materials for additive manufacturing.

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